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10/720,636

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Robert M. Zeidman

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EXAMINER

RUTTEN, JAMES D

ART UNIT

PAPER NUMBER

2192

MAIL DATE

DELIVERY MODE

11/01/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/720,636

Applicant(s)

ZEIDMAN, ROBERT M.

Examiner

J. Derek Rutten

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2192

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 October 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 23-47 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 23-47 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

1. This action is in response to Applicant's submission filed 10/1/07, responding to the 7/31/07 Office action which detailed the rejection of claims 1-22. Claims 1-22 have been canceled, and new claims 23-47 have been added. Claims 23-47 remain pending in the application and have been fully considered by the examiner.

Response to Arguments

2. The cancellation of claims 3, 4, 14, and 15 has obviated their rejection under 35 U.S.C. 112, second paragraph. Therefore, the rejections are withdrawn.

The cancellation of claims 1-22 has obviated their rejections under 35 U.S.C. 103. Therefore, the rejections are withdrawn.

3. On page 11 filed 10/1/07, Applicant essentially argues that the prior art of record, Arnow does not disclose a comparison of array elements regardless of the order of code lines, nor does it disclose an indication defined by a larger number of program elements. This argument is partially persuasive. Arnow does not appear to disclose a comparison of array elements regardless of the order of code lines. However, as explained in the rejection of claim 23 below, Arnow inherently disclose an indication defined by a larger number of program elements. Nonetheless, upon further consideration, a new ground of rejection is made in view of prior art of record "A Technique for Isolating Differences Between Files" by Heckel.

4. It is noted that the "means for" language in claims 41-47 fails to invoke treatment under 35 U.S.C. 112, sixth paragraph, since each "means for" limitation is modified by sufficient structure and acts for achieving the specified functions. See MPEP 2181(I).

Specification

5. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: The following terms in claim 33 are not present in the originally filed specification: "computer-readable medium," "executable instructions," and "computer system."

Claim Rejections - 35 USC § 101

6. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

7. Claims 33-40 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claim 33 is directed to a "computer-readable medium having executable instructions..." However, the originally filed specification does not provide any definition of what should be considered to be such a "computer-readable medium."

Interpretation of the limitation could include such non-tangible media as wireless transmission media, or an electro-magnetic signal. Claims that recite nothing but the physical characteristics of a form of energy, such as a frequency, voltage, or the strength of a magnetic field, define energy or magnetism, per se, and as such are nonstatutory natural phenomena. O'Reilly, 56 U.S. (15 How.) at 112-14. Moreover, it does not appear that a claim reciting a signal encoded with functional descriptive material falls within any of the categories of patentable subject matter set forth in Sec. 101. First, a claimed signal is clearly not a "process" under § 101 because it is not a series of steps. A claimed signal has no physical structure, does not itself perform any useful,

concrete and tangible result and, thus, does not fit within the definition of a machine. A claimed signal is not matter, but a form of energy, and therefore is not a composition of matter. A product is a tangible physical article or object, some form of matter, which a signal is not. In contrast, a tangibly claimed computer-readable medium (e.g. magnetic or optical disk) encoded with a data structure defines structural and functional interrelationships between the data structure and the computer software and hardware components which permit the data structure's functionality to be realized, and is thus statutory. Claims 34-40 are rejected as failing to cure the deficiencies of a rejected base claim.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 23-47 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Independent claims 23, 33, and 41 recite:

...comparing the **program elements** from the first array with the **program elements** from the second array...
...wherein the indication of plagiarism is defined by a **larger** number of **program elements** resulting from the comparison.
[emphasis added]

The term "larger" in claims 23, 33, and 41 is a relative term which renders the claim indefinite. The term "larger" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The "indication of plagiarism" is claimed as

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being “defined by a larger number of program elements resulting from the comparison.” It is not clear which “larger” number would be defined as an indication of plagiarism, i.e. a threshold for plagiarism.

Also, the claims recite program elements present in first and second arrays which are compared. The claims go on by suggesting that a number of program elements result from the comparison. As claimed, the program elements appear to be both preexisting in the arrays, and also somehow generated as a result of the comparison. Therefore, the scope of such program elements is not clear.

Further, the language of the claims implies that there are two instances of a “number of program elements,” and that the indication of plagiarism is defined by the larger of the two.

However, the question arises, “larger than what?”

Each of the above issues hinges on the limitation “a larger number of program elements” For the purpose of further examination, the limitation “a larger number of program elements” will be interpreted as “a plurality of matching program elements. Claims 24-32, 34-40, and 42-47 are rejected as being dependent upon a rejected base claim.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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11. Claims 23, 24, 26-30, 33-39, and 41-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over prior art of record “:-)When you grade that: using e-mail and the network in programming courses” by Arnow (hereinafter “Arnow”) in view of prior art of record “A Technique for Isolating Differences Between Files” by Heckel (hereinafter “Heckel”).

In regard to claim 23, Arnow discloses:

A computer-implemented method (see second paragraph of Appendix II on page 13) comprising:

creating a first [data structure] for a first program source code file including a plurality of program elements, the first [data structure] containing program elements of a distinct program element type represented by any one of lines of functional program code, lines of program comments, or program code identifiers; creating a second [data structure] for a second program source code file including the plurality of program elements, the second [data structure] containing program elements of the same program element type as the program elements in the first [data structure]; See Arnow page 13, right column; 2nd paragraph, e.g.:

It carries out a number of transformations on each student's code and then makes pairwise comparisons. First, the program is separated into two files, one containing only the comments, the other containing the code without the comments.

Thus, Arnow discloses at least two program source code files including a plurality of program elements. Arnow does not expressly disclose creating a first and second array for the first and second program source code files. However, Heckel teaches using arrays to store and compare program elements. See section 1, first paragraph, in the right column on page 264, e.g. “This discussion is directed toward building a tool that locates

differences in source programs and other text files.” Also see Fig. 1 on page 266 which depicts the contents of a file arranged as an array.

comparing the program elements from the first [data structure] with the program elements from the second [data structure], the comparison being performed between individual program elements ... containing the program elements in the first [data structure] and the second [data structure] during the comparison; and See Arnow page 13, right column, 2nd paragraph, e.g. “then makes pairwise comparisons.” Arnow does not expressly disclose: *regardless of an order of code lines*. However, Heckel teaches comparison regardless of an order. See Fig. 1, which depicts out of order matching.

presenting to a user an indication of plagiarism with respect to at least one of the first program source code file and the second program source file, wherein the indication of plagiarism is defined by <... matching> program elements resulting from the comparison. See page 13, right column, 2nd paragraph, e.g. “The pairwise comparison is based on the number of lines resulting from the diff utility in Unix – smaller numbers suggesting plagiarism.” Note that the diff utility presents the results of the comparison to the user, and Arnow describes it as providing an indication of plagiarism. Arnow does not expressly disclose an indication of: *a <plurality of matching program elements>* (note that the limitation “*plurality of matching program element*” is used in place of “larger number” for the purpose of further examination as pointed out in the above rejection under 35 U.S.C. 112, second paragraph). However, prior art of record Johnson describes the use of the diff utility such that not only are mismatches displayed, but also matches. See example at the top of page 2:

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```
diff -u 1 2
--- 1   Sat Apr 20 22:11:53 1996
+++ 2   Sat Apr 20 22:12:01 1996
-1,9 +1,9
  Ecce Eduardus Ursus scalis nunc tump-tump-tump
  occipite gradus pulsante post Christophorum
  Robinum descendens. Est quod sciat unus et solus
-modus gradibus descendendi, non nunquam autem
+modus gradibus descendendi, nonnunquam autem
  sentit, etiam alterum modum exstare, dummodo
-pulsationibus desinere et de no modo meditari
+pulsationibus desinere et de eo modo meditari
  possit. Deinde censet alios modos non esse. En,
  nunc ipse in imo est, vobis ostentari paratus.
  Winnie ille Pu.
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Here, 7 lines are shown as matching, while 2 lines are shown as mismatches. As such, Johnson describes an inherent feature of the diff utility used by Arnow, namely that matching lines are shown along with mismatched lines. While Arnow clearly discusses a small number of mismatches as indicating plagiarism, the inverse here is also inherently disclosed by Arnow as suggested by Johnson. That is, a relatively small number of mismatches is the same as a relatively large number (i.e., a plurality) of matches. Thus, Arnow inherently discloses a *plurality* of matches.

As noted above, Arnow does not expressly disclose using arrays to manipulate program source code, and also does not expressly disclose comparison of program elements regardless of an order of code lines. However, these limitations are taught by Heckel, as shown above. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use Heckel's teaching of array use along with out-of-order comparison along with Arnow's code comparison in order to utilize Heckel's algorithm which is useful for detecting differences that correspond closely with an intuitive notion of difference, as suggested by Heckel (see second paragraph in section 2, on page 264, right column).

In regard to claim 24, the above rejection of claim 23 is incorporated. Arnou further discloses: *substituting each sequence of whitespace characters in each program element in the first array and the second array with a single space character*. See page 13, 2nd column, 2nd paragraph, e.g. “spaces and tab sequences are reduced to single spaces.”

In regard to claim 26, the above rejection of claim 23 is incorporated. Arnou further discloses:

the program element type of the program elements in the first and second arrays is a line of functional program code; and See page 13, 2nd column, 2nd paragraph. This provides a description of separating program code into two files, one of which containing only programming code and no comments. This is done for “each student’s code.” That is, a first and second source code file.

the method further comprises: prior to comparing, eliminating from the first and second arrays lines of functional program code that consist entirely of programming keywords. See page 13, 2nd column, 2nd paragraph, e.g. “one containing only the identifiers, the other only the keywords and operators.”

In regard to claim 27, the above rejection of claim 23 is incorporated. Arnou further discloses:

the program element type of the program elements in the first and second arrays is a line of program comments; ; See page 13, 2nd column, 2nd paragraph. This provides a description of separating program code into two files, one of which containing only comments and no functional programming. This is done for “each student’s code.” That is, a first and second source code file.

and comparing the program elements from the first array with the program elements from the second array comprises finding a number of matching lines in the first and second arrays. See page 13, 2nd column, 2nd paragraph, e.g. “pairwise comparison.”

In regard to claim 28, the above rejection of claim 23 is incorporated. Arnou further discloses:

the program element type of the program elements in the first and second arrays is a line of functional program code excluding functional program code consisting entirely of program language keywords; See page 13, 2nd column, 2nd paragraph, e.g. “one containing only the identifiers, the other only the keywords and operators.”

and comparing the program elements from the first array with the program elements from the second array comprises finding a number of matching lines in the first and second arrays. See page 13, 2nd column, 2nd paragraph, e.g. “pairwise comparison.”

In regard to claim 29, the above rejection of claim 23 is incorporated. Arnou further discloses:

the program element type of the program elements in the first and second arrays is a program code identifier; See page 13, 2nd column, 2nd paragraph, e.g. “one containing only the identifiers, the other only the keywords and operators.”

and comparing the program elements from the first array with the program elements from the second array comprises finding a number of similar identifiers in the first and second arrays. See page 13, 2nd column, 2nd paragraph, e.g. “pairwise comparison.”

In regard to claim 30, the above rejection of claim 29 is incorporated. Arnow further discloses: *wherein the similar identifiers represent exact matches.* Arnow discloses the use of diff, which as described by the Johnson reference (see the listing at the top of page 2 – exact matches are shown without a “+” or “-”) provides inherent disclosure of exact matches.

In regard to claim 33, Arnow discloses:

A computer-readable medium having executable instructions to cause a computer system to perform a method comprising: ... See section 9 on page 12, right column, which describes implementation using SunOS 4.X, which requires the use of a computer-readable medium having executable instructions in order to perform computerized methods including the use of the diff utility described in Appendix II on page 13. Without a computer-readable medium, the OS would be unable to load or store

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instructions or data for the processor to execute. All further limitations have been addressed in the above rejection of claim 23.

In regard to claims 34-39, the above rejection of claim 33 is incorporated. All further limitations have been addressed in the above rejections of claims 24 and 26-30, respectively.

In regard to claim 41, Arnow discloses:

A computer-implemented apparatus comprising: a computer; See section 9 on page 12, e.g. “a network of workstations running SunOS 4.X.

and a source code matching program on the computer, See Appendix II on page 13, second paragraph, e.g. “plagiarism detector.”

the source code matching program comprising:

...means for creating ...; means for comparing ... ; and means for presenting ...

See section 9 on page 12, e.g. “a network of workstations running SunOS 4.X.

All further limitations have been addressed in the above rejection of claim 23.

In regard to claims 42-46, the above rejection of claim 41 is incorporated. All further limitations have been addressed in the above rejections of claims 26-30, respectively.

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12. Claims 25, 31, 32, 40, and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arnou and Heckel as applied to claim 1 above, and further in view of prior art of record “Plagiarism in natural and programming languages: an overview of current tools and technologies” by Clough (hereinafter “Clough”).

In regard to claim 25, the above rejection of claim 23 is incorporated. Arnou and Heckel do not expressly disclose: *wherein the comparison is insensitive to whether characters of the program elements are uppercase or lowercase*. However, Clough teaches that the YAP system translates upper-case letters to lower case letters. See page 24 under “Preprocess the submitted reports.” It would have been obvious to one of ordinary skill in the art at the time the invention was made to use Clough’s case translation with Arnou’s program code in order to preprocess text for tokenization as suggested by Clough.

In regard to claim 31, the above rejection of claim 29 is incorporated. Arnou does not expressly disclose: *wherein the similar identifiers represent partial matches*. However, Clough teaches matching substrings. See page 22, bulleted list in section 4.1.3, e.g. “q as a substring of S.” It would have been obvious to one of ordinary skill at the time the invention was made, to use Clough’s teaching of substring matching with Arnou’s plagiarism detector in order to detect systemic changes to variable names as suggested by Clough (see 1st paragraph in section 4.1.3).

In regard to claim 32, the above rejection of claim 31 is incorporated. Arnow does not expressly disclose: *wherein each partial match is a sequence of characters that can be found within an element of the first array and an element of the second array.* However, Clough teaches matching substrings. See page 22, bulleted list in section 4.1.3, e.g. "q as a substring of S." It would have been obvious to one of ordinary skill at the time the invention was made, to use Clough's teaching of substring matching with Heckel's arrays in addition to Arnow's plagiarism detector in order to detect systemic changes to variable names as suggested by Clough (see 1st paragraph in section 4.1.3).

In regard to claim 40, the above rejection of claim 39 is incorporated. All further limitations have been addressed in the above rejection of claim 32.

In regard to claim 47, the above rejection of claim 46 is incorporated. All further limitations have been addressed in the above rejection of claim 32.

Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to J. Derek Rutten whose telephone number is (571)272-3703. The examiner can normally be reached on M-F 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Q. Dam can be reached on (571)272-3695. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. Derek Rutten/
Patent Examiner, AU 2192